2. Formic and acetic acids are to be regarded as constant products of metastasis in vegetable protoplasm. 3. It is probable that other members also of the unstable group of fatty acids, as for instance, proprionic acid, butyric acid, caproic acid, or even the whole group, are universally distributed in the vegetable kingdom. 4. An increase of the amount of unstable acids takes place in a plant-organism when its assimilation is interfered with by deprivation of light, *i.e.* when put into a state of starvation (inanition). 5. Formic and acetic acids accordingly belong to the constituents of regressive tissue-metamorphosis. It has been premised that the homologous, unstable fatty acids have a similar import in vegetable tissue-metamorphosis. 6. No increase in the amount of unstable acids takes place in a plant-organism, which is withdrawn for a period from the light, under the minimum-temperature required for growth. 7. Accordingly the formation of formic and acetic acids in a plant seems to take place to a certain degree independently of respiration. 8. Acetic and formic acids are mainly to be regarded as decomposition products of the constituents of vegetable protoplasm.

GEOGRAPHICAL NOTES

DR. WISSMANN, of the German African Society has, it is stated, just arrived at Zanzibar, having left Loando in April, 1881, in company with Dr. Pogge. Striking inwards across the numerous streams that take their origin in the great watershed which separates the Congo and Zambesi basins, the travellers were at Mukenge, about 6° S. and 22° E., in November last year. Shortly after they set out for Nyangwe on the Lualaba, whence Wissmann proceeded eastwards to Zanzibar, while Pogge turned back to Mukenge, there to plant a station. The details of this journey will doubtless be full of novelty and interest.

THE German African Society has recently issued a report upon its latest undertakings. There are now four German expeditions in Africa, two proceeding from the east, and two from the west. In the east there is Dr. Stecker, who as the companion of Dr. Rohlfs, paid a visit to King John of Abyssinia, and then continued his journey through the Soudan. His last letter is dated February 15. Dr. Böhrn and Dr. Kayser, who belong to Capt. von Schöler's expedition, report upon a three months' journey to Lake Tanganyika, from which they returned to the station at the end of 1881. From the Gondo Station itself Herr Paul Reichard, who remained there, sends a report; Capt. v. Schöler, after founding a station at Kakama, proceeded to Zanzibar. News has also been received regarding the exploration of the Wala River, to the west of Gondo, as far as its mouth, by Dr. Böhrn and Herr Reichard. On the other hand, Robert Flegel is busily at work. He has taken a minute cartographical survey of the hitherto unknown part of the Niger, between Inuri and Shay. In the spring of 1881 he prepared for a journey to Southern Adanana. He reached Keffi at the beginning of December; thence he intended to proceed by way of Schiber, on the Binne River, through the "heathen lands" to Kantscha and Yola, south of the Binne, then winter there, and thence proceed by water from Meo Kebbi to the Tubori Marsh to Kuka.

AT the beginning of November, Dr. Arthur Krause returned to Germany from his journey to the Chukchi Peninsula and Alaska, which he undertook, partly in company with his brother, Dr. Aurel Krause, and partly alone, at the instance of the Bremen Geographical Society. Dr. Aurel Krause returned to Germany last summer by way of Panama, while his brother remained in Alaska until the autumn. The two brothers have made copious collections of natural history and ethnographical specimens.

THE November number of *Petermann's Mittheilungen* contains an account by Dr. Gerhard Rholfs of the results of his recent journey in Abyssinia. Dr. Ferd. Löwl, of Prag, has a long and able paper on the origin of transverse-valleys; Lieut. Kreitner describes the route from Ansifan through the Gobi desert to Hami; while there are interesting letters from Emin-Bey, Lupton-Bey, and Dr. Junker, mainly referring to the work of the Russian explorer in the Welle region. He has been doing much to clear up the hydrography of the region, and has come to the conclusion that the Welle is really the upper course of the Shari, while the Aruwimi, the great tributary of the Congo, rises further to the east.

A SPECIAL supplement to the *Chamber of Commerce Journal* contains an account by Mr. Colquhoun of his recent journey through Yunnan to Burmah, accompanied by an excellent map. Under the title of "Across Chrysê," Messrs. Sampson Low and Co. will shortly publish a detailed narrative, with many illustrations, of Mr. Colquhoun's journey.

THE ordnance survey of Scotland, a work which has been going on for thirty-seven years, has been completed, and the surveying staff will be withdrawn from Scotland next week. During the last few years nearly a hundred men have been employed in the work.

THE Emperor of Russia has ordered 2200*l.* to be allotted from the Imperial Treasury to the Russian traveller in New Guinea and the Malay Archipelago, M. Miklucho Maklay, in order to enable him to work up the results of his explorations. His Majesty has also ordered M. Maklay to be informed that the cost of the publication of his book of travels will be defrayed by the privy purse.

THE PELAGIC FAUNA OF FRESHWATER LAKES

SEVERAL naturalists have within recent years made the pelagic fauna of freshwater lakes in various regions a subject of study. In the *Archives des Sciences* for September, Prof. Forel gives a list of those researches, with a *résumé* of the results they have yielded.

This fauna has but few species; but the number of individuals of each species is, on the other hand, enormous. The following is an enumeration of the species observed:—

OSTRACODA: *Cypris ovum*. CLADOCERA: *Sida crystallina, Daphnella brachyura, D. pulex, D. magna, D. longispina, D. hyalina, D. cristata, D. galeata, D. quadrangula, D. mucronata, Bosmina longirostris, B. longispina, B. longicornis, Bythotrephes longmanus, Leptodora hyalina*. COPEPODA: *Cyclops coronatus, C. quadricornis, C. serrulatus, C. tenuicornis, C. brevicornis, C. minutus, Heterocope robusta, Diaptomus castor, D. gracilis*.

The author excludes from consideration those animals that enter into the pelagic fauna in an accidental and accessory way, such as fishes (especially *Coregonus*), preying on the entomostraca, and other fishes which prey on those, also infusoria living on pelagic algæ, and animals coming occasionally from the border or the bottom of a lake.

The pelagic fauna is, in its general *traits*, very much the same in all European lakes where it has been examined, from the plains to the Alps, from Scandinavia to Italy. But it is rarely represented in one lake by all animals of the fauna. Pavesi has made a very complete study, in this respect, of the Italian lakes, giving, for each, a complete list of the species found. But an observation by Weissmann has to be remembered here. He found that the different species of Cladocera presented an annual periodicity; they disappear at certain seasons (different for different species), when they are represented only by eggs. Thus the list of pelagic animals of a lake, to be complete, must be based on numerous takes in different seasons.

The common characters of the fauna accord with the mode of life, which involves constant swimming; thus the animals have no organ of fixation, but a well-developed organ of natation. Their density, nearly equal to that of water, enables them to float between two waters without exerting themselves much. Their movements are slow, and they escape enemies rather by their transparence than by agility. This transparence is, indeed, their essential character; they do not generally show a visible point, except that of their eye, which is strongly pigmented with black, brown, or red. The quality of transparence may be interpreted as a case of mimicry.

The food of the fauna is vegetable or animal. Some feed on pelagic algæ, few in species, *Anabæna circinalis, Pleurococcus angulosus, Pl. palustris, Tetraspora virescens, Palmella Ralfsii*, but very abundant in individuals; others pursue and eat the smallest animal species living in the same waters.

The pelagic animals present daily migrations; swimming near the surface at night, and remaining in the depths by day. Fric thought he found, in the Bohemian lakes, each species select a determinate depth; neither Pavesi nor the author have observed such constancy. The different species form groups, or troops, where the net makes rich captures, but these banks of animals of the same species, have not, at least in the large Swiss lakes, a determinate fixed position.

As to the maximum depth at which they are found, Prof. Forel has taken them in Lake Leman as deep as 100 and even 150 metres; at the greatest depths only *Diaptomus*.

The optic nerve of those animals probably suffers from too bright light, and so they descend whenever the light of sun or moon becomes too strong; still, they require some light to seek their prey. In their migrations they traverse a considerable thickness of water. What is the limit of light in freshwater lakes? The author showed in 1877, that the transparence varied with the season; it is much greater in winter than in summer. Under the most favourable conditions, a bright object sinking in the water of Lake Leman disappears at about 16 or 17m. depth. Paper sensitised with chloride of silver gave as *light-limit* in Lake Leman 45 m. in summer, and 100 m. in winter. Asper, using more sensitive plates (prepared with bromide of silver emulsion), found the *actinic* rays still active in the Lake of Zurich at 90 m. and more. All this, however, does not determine the limit of absolute obscurity for the retina, and especially for the optic nerve of lower animals.

With regard to the origin of this pelagic fauna, Prof. Forel confidently rejects the idea of local differentiation of littoral species in each lake, producing the pelagic fauna of the lake. The very remarkable character of generality, the almost absolute identity of the pelagic entomostraca in all European lakes point to dissemination and mixture.

How has this dissemination occurred? Active migration from one lake to another is inadmissible, considering obstacles and power of locomotion. On the other hand, a passive migration in the state of winter eggs, attached to the feathers of birds of passage, ducks, grebes, gulls, &c., explains the transport sufficiently. Pavesi has argued against this common origin and mode of dissemination, on account of irregularity in the pelagic population of different Italian lakes, certain species being absent in certain lakes, while they are represented in neighbouring lakes. But this irregularity seems to the author to correspond perfectly with the accidental and fortuitous character of the mode of dissemination referred to. "If this mode of transport be admitted, the differentiation of pelagic species is no longer necessarily localised in the lake in which we find the animals, any more than in the present geological epoch. This fact is very important for explanation of the pelagic fauna of certain lakes the origin of which is comparatively modern; for our Swiss lakes, the glacial epoch forms an absolute limit which prevents our supposing a local differentiation of ancient tertiary species, and their transformation into our present species; the origin of the pelagic faunas of certain Italian lakes of volcanic nature, is still more modern. But since we are no longer limited to a local differentiation of autochthonous species, we find more time and more space for this process of differentiation."

Prof. Forel believes the cause of differentiation of pelagic fauna will be found in a combination of two facts, viz., the daily migrations of entomostraca, and the regular local breezes on large lakes. There are two such breezes in calm weather, one blowing from the land at night, the other from the water by day. Crepuscular animals of the shore region, which come to swim on the surface at night, are carried out into the lake by the surface-current of the land breeze. By day the light sends them down, and thus they escape the surface current of the breeze that would bring them back to the shore. Carried each night further out, they become finally relegated to the pelagic region. Differentiation by natural selection then operates, and after a few generations, there remain only the admirably transparent animals and excellent swimmers we know. This differentiation once effected, the pelagic species is transported by the migratory birds from one country to another, from one lake to another, where it is multiplied, if the conditions are favourable. Thus we may find, even in lakes too small to possess an alternation of breezes, true pelagic Entomostraca that have been differentiated in other larger lakes by the play of such breezes. The differentiation of most pelagic species may thus be easily accounted for.

There are two species, however, the author points out, whose origin is not so explained; these are the most beautiful and interesting of pelagic Entomostraca: *Leptodora hyalina* and *Bythotrephes longimanus*. These two Cladocera have no known parentage in the freshwater species forming either the shore fauna of lakes or the marsh or river fauna. We must, with Pavesi, seek a marine origin for them. *Bythotrephes* probably descended from a common ancestor with Podon, its nearest parent, and the *Leptodora* from a primitive Daphnis.

How did the passage from salt to fresh water take place? Pavesi supposes closure of a fjord and gradual transformation of the lake water in consequence. Prof. Forel further suggests as possible, passive migration and successive transport to lagoons less and less salt; and there may have been other ways. We have not the elements for settling the question. "But the adaptation to fresh water once accomplished, the dissemination of these forms of marine origin has certainly taken place like that of other pelagic fresh-water forms, and those two species have so been transported into lakes which have never had direct communication with the sea."

There are evident analogies, Prof. Forel remarks in closing, between the lacustrian and the marine pelagic fauna; the differences appear chiefly in relative size and proportions. In the sea all is on a large scale; in lakes, on a small; the number of species and of individuals, the size, the extent of the migrations, the area of extension. But, with this exception, the general laws are the same in the two analogous faunas.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

FOUR chairs in the University College, Dundee, have been filled up as follows:—Mr. Steggall, Fielden Lecturer in Mathematics, in Owens College, Manchester, was appointed Professor of Mathematics; Mr. Carnelly, Professor of Chemistry in Firth College, Sheffield, was appointed Professor of Chemistry; Mr. Ewing, Professor of Engineering in the University of Tokio, Japan, was appointed to the Chair of Engineering; and Mr. Thomas Gilray, M.A., Head Master in English at Glasgow Academy, to the Chair of English Literature and Modern History. The salary guaranteed to each professor is 500*l*.

THE University of Zürich will, at the end of the current winter term, celebrate the fiftieth anniversary of its foundation.

SCIENTIFIC SERIALS

The Journal of Anatomy and Physiology, vol. xvii. Part 1, October, 1882, contains:—On the lymphatics of the walls of the larger blood-vessels, and lymphatics, by Drs. George and Elizabeth Hoggan.—On micrococcus poisoning, by Dr. A. Ogston.—On omphalo-mesenteric remains in mammals, by Dr. W. Allen.—On the action of saline cathartics, by Dr. M. Hay.—On a hitherto undescribed fracture of the Astragalus, by Dr. F. J. Shepherd.—On a secondary astragalus in the human foot, by Prof. W. Turner.—Note on the rectus abdominalis et sternalis muscle, by Dr. G. E. Dobson.—On a case of ectopia vesicæ, &c., in a newly-born infant, by Dr. F. Ogston.—On nickel and cobalt; their physiological action on the animal organism. Part i., Toxicology, by Dr. T. P. A. Stuart.—A kerato-thyro-hyoid-muscle as a variation in human anatomy, by S. G. Shattock.—On Cesalpino and Harvey, by Prof. Humphry.

The Proceedings of the Linnean Society of New South Wales, vol. vii. part 1 (Sydney, 1882), contains: Wm. A. Haswell, on the structure of the paired fins of Ceratodus (plate 1).—Notes on the anatomy of *Ædirhinus insolitus* and *Turacæna crassirostris*.—Wm. Macleay, on Port Jackson Pleuronectidæ, with descriptions of new species; on the fishes of Palmer River; on an Alpine species of Galaxias.—E. P. Ramsay, the zoology of the Solomons, Part IV.; on a new species of Mus from Ugi Island; contributions to Australasian oology (plates 3-5); on the zoology of Lord Howes Island; on *Apogon guntheri* of Castelnau; on some Fijian bird's eggs.—Alex. Morton, notes of a cruise to the Solomons.—Prof. F. W. Hutton, note on *Fossarina petterdi*; list of New Zealand freshwater shells.—Rev. Dr. Wools, the plants of New South Wales, No. 8.—Rev. J. E. T. Woods, botanical notes on Queensland; on a new species of Stomopneustes, and a new variety of *Hipponoe variegata*; on fossil plants of Queensland.—J. Brazier, fluviatile shells of New South Wales; a list of Cypræidæ of the Victorian coast.—Wm. Mitten, on some Polynesian mosses.—Rev. C. Kalchbrenner, new Australian fungi.—Dr. J. C. Cox, on the edible oysters of Australia.

Journal and Proceedings of the Royal Society of New South Wales, vol. 15, 1882, contains: On the climate of Mackay, by H. L. Roth.—Notes of a journey on the Darling, by W. E. Abbott.—The astronomy of the Australian aborigines, by Rev. P. MacPherson.—On the spectrum of the recent comet; on